QUESTION PAPER DESIGN

Subject : Mathematics

Secondary Course

Marks : 85 **Time : 2½ Hrs**

1. Weightage by Objectives

S. No.	Objectives	Marks	% of Total Marks
1.	Knowledge	25	30% approximately
2.	Understanding	42	50% approximately
3.	Application	10	11% approximately
4.	Skill	8	9% approximately

2. Weightage by Types of Questions

S. No.	Type of Questions	No. of Questions	Marks	Estimated Time (in Minutes)
1.	Long Answer	3	18	10 × 3 = 30
2.	Short Answer	8	32	8 × 6 = 48
3.	Short Answer (2 marks questions)	10	20	3 × 10 = 30
4.	Very Short Answer (1 mark questions)	15	15	2 × 15 = 30
	Total	**36**	**85**	**138 Minutes**

* 12 min for revision

3. Weightage by Content

S. No.	Module	Marks
1.	Algebra	20
2.	Commercial Mathematics	08
3.	Geometry	25
4.	Mensuration	10
5.	Trigonometry	10
6.	Statistics	12
	Total	**85**

SAMPLE QUESTION PAPER
Subject : Mathematics (211)
Secondary Course

Max. Marks : 85 **Time : 2½ Hrs**

Note : 1. *Question Numbers (1-10) are Multiple Choice Questions. Each question carries one mark. For each question, four alternative choices A, B, C, D are given, of which only one is correct. You have to select the correct alternative and indicate it in the box provided against each question by writing A, B, C or D as the case may be.*

2. *Question Numbers (11-15) are very short answer type questions, each carrying 1 mark. Here the answer can be one word or one sentence or as per the exact requirement of the question.*

3. *Question Numbers (16-25) carry 2 marks each.*

4. *Question Numbers (26-33) carry 4 marks each.*

5. *Question Numbers (34-36) carry 6 marks each.*

6. *All questions are complusory.*

1. In terms of powers of prime numbers, 1260 can be written as :

(A) $2^2 \times 3 \times 5^2$ (B) $2^2 \times 3^2 \times 5 \times 7$ (C) $2 \times 3^2 \times 5^2 \times 7$ (D) $2^2 \times 3 \times 5 \times 7^2$ ☐

2. The product of $(2x - 3$ and $(2x + 3)$ is :

(A) $2x^2 - 3$ (B) $4x^2 - 3$ (C) $4x^2 - 9$ (D) $4x^2 + 9$ ☐

3. 0.35% expressed as a decimal, is equal to :

(A) 0.35 (B) 0.035 (C) 0.0035 (D) 3.5 ☐

4. 15% of 1080 is :

(A) 161.20 (B) 162 (C) 322.40 (D) 3224 ☐

5. In Fig. 1, ABC is a triangle in which

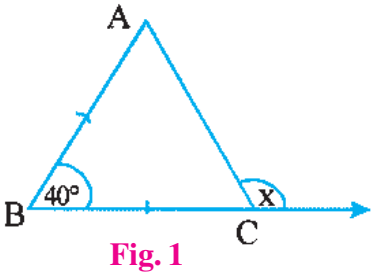
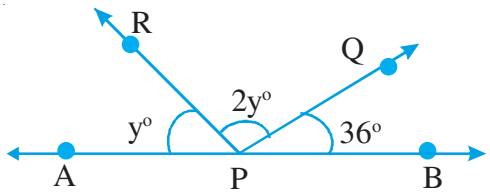


Fig. 1

AB = BC and ∠ B = 40°, then x equals :

(A) 110° (B) 120° (C) 140° (D) 70° ☐

6. In Fig. 2, if ∠BPQ = 36°, then y equals



(A) 36° (B) 72° (C) 46° (D) 48° ☐

7. In Fig. 3, $\angle ACD = 80°$ and $\angle CBD = 45°$, then the value of x is

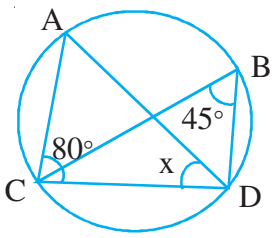


Fig. 3

(A) 50° (B) 55° (C) 35° (D) 135° ☐

8. The value of tan 1°. tan 89° is :

(A) $\frac{1}{2}$ (B) $\frac{3}{2}$ (C) 1 (D) $\frac{1}{\sqrt{3}}$ ☐

9. If $\text{Sin}\,\theta = \frac{a}{b}$, then $\cos\theta$ equals :

(A) $\frac{\sqrt{b^2 - a^2}}{b}$ (B) $\frac{\sqrt{a^2 - b^2}}{b}$ (C) $\frac{b}{\sqrt{b^2 - a^2}}$ (D) $\frac{b}{a}$ ☐

10. In a frequency distribution, the class mark of a class is 10 and its width is 5. The lower limit of class is:

(A) 5 (B) 7.5 (C) 10 (D) 12.5 ☐

11. In Fig. 4, DE || BC, BC = 6 cm, DE = 4.5 cm and AE = 3 cm. Find the length of AC.

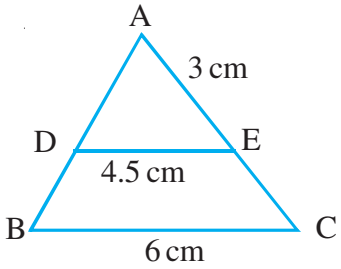


Fig. 4

12. In Fig. 5, a circle with centre O has radius 1.5 cm. If PT is a tangent to the circle at P, find the length of OT.

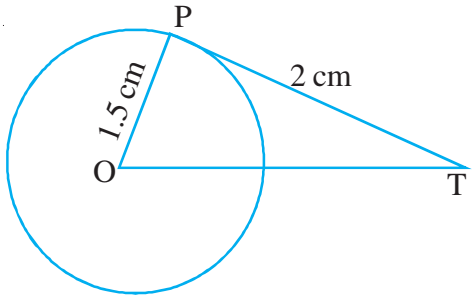


Fig. 5

13. Find the area of a trapezium whose parallel sides are 20cm and 16cm, distance between these sides is 6cm.

14. Find the volume of a right circular cylinder of radius 1.4 m and height 10 m.

15. Find the median of the data, 2,1,5,7,1.

16. The 5th term of an A.P is 14 and its 12th term is 35. Find the first term and the common difference of the A.P.

17. The HCF of two polynomials $x^2 - 5x + 6$ and $x^2 - 7x + 12$ is $x - 3$. Find the LCM of the polynomials.

18. In what time will Rs. 2700 yield the same simple interest at 4% per annum as Rs. 2250 in 4 years at 3% per annum?

19. In Fig. 6, the sides of a triangle ABC are produced in order to form the exterior angles 1, 2 and 3. show that $\angle 1 + \angle 2 + \angle 3 = 360°$

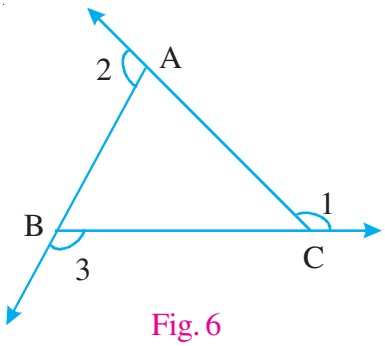


Fig. 6

20. Two line segments AB and CD bisect each other at O, as shown in Fig. 7. Prove that

    CA = BD

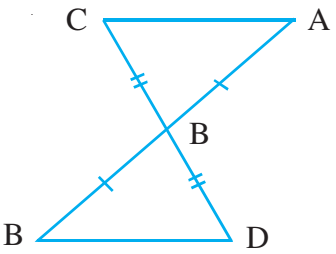


Fig. 7

21. In Fig. 8, triangles ABC and DBC are on the same base BC and between the same parallel lines l and m. If ar (Δ ABC) = 18 cm^2 and DL $\perp$ m, find the length of DL when BC = 4.5cm

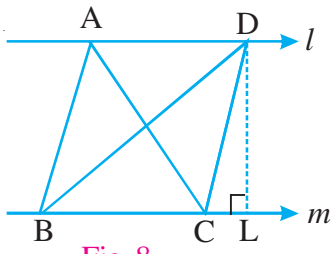


Fig. 8

22. A circular garden of radius 15m has a 2m wide circular path inside arround it. Find the area of the path.

23. Find the radius of a sphere whose surface area is 616 cm^2.

24. Evaluate : Cos 43°. Cot 79° – Sin 47°. tan 11°

25. A pole of height 6 m casts shadow of $2\sqrt{3}$ m on the ground. Find the Sun's elevation.

26. Evaluate a^3+b^3, if a+b = 7 and ab = 12.

27. A two digit number is such that the product of its digits is 12. When 36 is added to the number, the digits interchange their places. Find the number.

28. A mobile set is marked at Rs. 3880 cash or for Rs. 840 cash down payment followed by three equal monthly instalments. If the rate of interest charged under the instalment plan is 16% per annum, find the monthly instalment.

29. In Fig. 9, the perimeter of Δ ABC is 27 cm. The incircle of Δ ABC touches the sides AB, BC and AC at P, Q and R respectively. If PA = 4cm and QB = 5 cm, find length of QC.

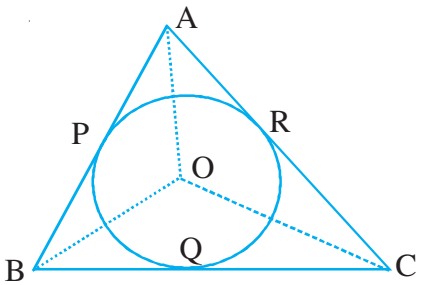


Fig. 9

30. Construct a Δ PQR in which PQ = 5 cm, QR = 4.2 cm and the median RS = 3.8 cm.

31. Find the total surface area of a solid cone whose volume is 12936 cm^3 and base radius is 21 cm.

32. Standing on the top of a tower 80m high, a person observes two cars on the opposite sides of the tower. If their angles of depression are 45^o and 30^o, find the distance between the cars.

[Use $\sqrt{3} = 1.73$]

33. The lengths (in mm) of 70 leaves were measured and recorded as given below

Length (mm) :	110-120	120-130	130-140	140-150	150-160	160-170
Number of Leaves :	10	12	20	15	8	5

Find the mean length of a leave.

34. A man sold a chair and a table together for ₹ 2100, thereby making a profit of 25% on the chair and 10% on the table. By selling them for ₹ 2130, he would have realised a profit of 10% on the chair and 25% on the table. Find the cost price of each.

35. In a right triangle, prove that the square on the hypotenuse is equal to sum of the squares on the other two sides.

36. An aircraft has 120 seats for passengers. The number of seats occupied during 100 flights is given below

Number of seats	**Frequency**
100-104	15
104-108	18
108-112	34
112-116	16
116-120	17

Find the mean number of seats occupied.

MARKING SCHEME

1. (B)	2. (C)	3. (C)	4. (B)	5. (A)
6. (D)	7. (B)	8. (C)	9. (A)	10 (B)
11. 4cm	12. 2.5cm	13. $108cm^2$	14. 61.6 m^3	15. 2

16. $a + 4d = 14$ and $a + 11d = 35$ ... 1

Getting $d = 3$ and $a = 2$ ... 1

17. LCM $= \dfrac{First\ Poly. \times Second\ Poly.}{HCF}$ ... $\frac{1}{2}$

$= \dfrac{(x^2-5x+6)(x^2-7x+12)}{x-3}$ ... $\frac{1}{2}$

$= (x^2-5x+6)(x-4) = x^3-9x^2+26x-24$ ... 1

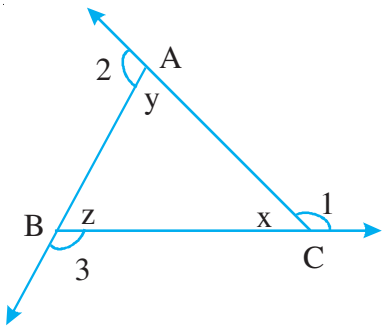
18. Interest in first case = Rs. $\left(\dfrac{2250\times4\times3}{100}\right)$ = Rs 270 ... $\frac{1}{2}$

In second case P = Rs. 2700, Rate = 4%, t = ?, I = Rs. 270 ... $\frac{1}{2}$

$\therefore t = \dfrac{270\times100}{2700\times4} = 2\dfrac{1}{2}$ ...1

19. (i) $\angle1 + \angle x = 180^o$ (ii) $\angle2 + \angle y = 180^o$

(iii) $\angle3 + \angle z = 180^o$ ...1



$\Rightarrow (\angle1 + \angle2 + \angle3) + (\angle x + \angle y + \angle z) = 540^o$ ... $\frac{1}{2}$

$\Rightarrow (\angle1 + \angle2 + \angle3) = 360^o \quad \because \angle x + \angle y + \angle z = 180^o)$ ... $\frac{1}{2}$

20. In Δs BDO and ACO

OB = OA, OD = OC, $\angle$BOD = $\angle$AOC (vert. opp. $\angle$s) ...1

$\therefore \Delta BDO \cong \Delta ACO$ ... $\frac{1}{2}$

$\therefore$ BD = CA (cpct) ... $\frac{1}{2}$

21. Area (ΔABC) = Ar (DBC) = 18 cm^2 (Δ's on the same base and between same parallels) ...1

Ar (ΔDBC) = $\frac{1}{2}$ (4.5) $\times$ DL = 18 cm^2

$\Rightarrow$ DL = $\dfrac{18\times2}{4.5}$ or 8 cm ..1

22. Outer radius of circular path = 15 m ... $\frac{1}{2}$

Inner radius of circular path = 13 m

$\therefore$ Area of path $= \frac{22}{7}\left(15^2 - 13^2\right) m^2$ ...1

$= 176\ cm^2$ ... $\frac{1}{2}$

23. Surface area of sphere = 616 cm^2

$\therefore\ 4\ \pi r^2 = 616$

$$4 \times \frac{22}{7} \times r^2 = 616$$

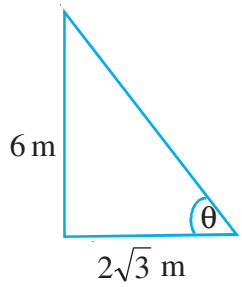
$$\Rightarrow r^2 = \frac{616 \times 7}{88}$$ ...1

r = 7 cm ...1

24. Sin 47° = sin (90 – 43)° = cos 43° = cot (90 – 11)° = tan 11° ...1

$\therefore$ Resulting expression = cos 43° tan 11° – cos 43° tan 11° = 0 ...1

25. Let sun's elevation be θ.



$\therefore\ \tan\theta = \frac{6}{2\sqrt{3}} = \tan 60°$ ...1

$\theta = 60^o$ ...1

26. a + b = 7, ab = 12

$\Rightarrow (a + b)^3 = a^3 + b^3 + 3ab\ (a + b)$ ...1 $\frac{1}{2}$

$343 = (a^3 + b^3) + 3 \times 12 \times 7$ ...1 $\frac{1}{2}$

$\Rightarrow a^3 + b^3 = 343 - 252 = 91$ ...1

27. Let x be ten's digit and y be unit's digit

$\therefore\ xy = 12 \Rightarrow y = \frac{12}{x}$ ...1

$10x + y + 36 = 10\ y + x \Rightarrow x - y = -4$ ...1

$$\therefore x - \frac{12}{x} = -4 \Rightarrow x^2 + 4x - 12 = 0$$ ..1

$x = 2, -6$ (Rejecting -6) ... $\frac{1}{2}$

$\therefore\ x = 2$

$\therefore\ y = 6$ ... $\frac{1}{2}$

$\therefore$ The number is 26.

28. Cash Price = Rs. 3880

Cash Down = Rs. 840, Let monthly instalment = x 1

$\therefore$ Interest paid = Rs $(3x - 3040)$

Principal paid for

1st month = Rs 3040

2nd month = Rs $(3040 - x)$

3rd month = Rs $(3040 - 2x)$ 1

Total principal for one month = Rs $(9120 - 3x)$ ... $\frac{1}{2}$

Interest = 16%

$$\therefore (9120 - 3x) \times \frac{16}{100} \times \frac{1}{12} = (3x - 3040))$$

$\Rightarrow x$ = Rs 1040 ...1

$\therefore$ Monthly instalment = Rs 1040 ... $\frac{1}{2}$

29. PA = PB (length of tangents from an external point) = 4 cm ...1

Similarly PB = QB = 5 cm ... $\frac{1}{2}$

Let QC = x = CA ... $\frac{1}{2}$

$\therefore\ (4 \times 2 + 5 \times 2 + 2x) = 27$ cm ...1

$\Rightarrow x = 4.5$ cm

$\Rightarrow$ QC = 4.5 cm ...1

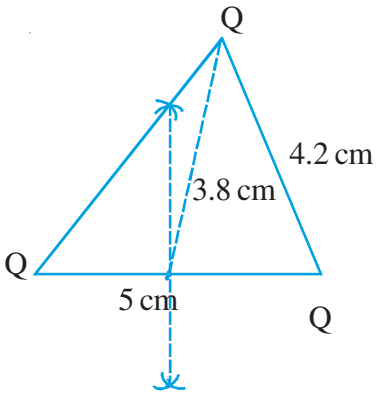
30. 1. Draw PQ = 5 cm Correct construction: 3

2. Bisect it at S correct steps : 1

3. With S and Q as centres and respective radii 3.8 cm and 4.20 cm draw arcs to ingersect at R

4. Join PR and QR

$\therefore$ PQR is the reqd. triangle.



31. Let h and l be the height and slant height of cone

Volume $= \frac{1}{3}\pi r^2 h$ ...1

$\therefore \frac{1}{3}\times\frac{22}{7}\times(21)^2\times h = 12936$ ... $\frac{1}{2}$

$\Rightarrow$ h = 28 cm

Again, $l^2 = 28^2 + 21^2 = 35^2$ 1

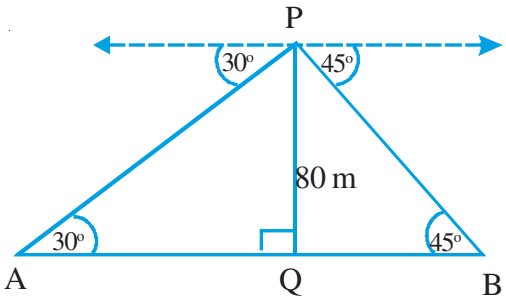
$\therefore$ Total surface area $= \frac{22}{7}\times 21[35+21]$ cm^2 ...1

$= 3696$ cm^2 ... $\frac{1}{2}$

32. $\frac{PQ}{QB} = \tan 45^\circ$ ...1

$\Rightarrow$ PQ = QB = 80m ...1

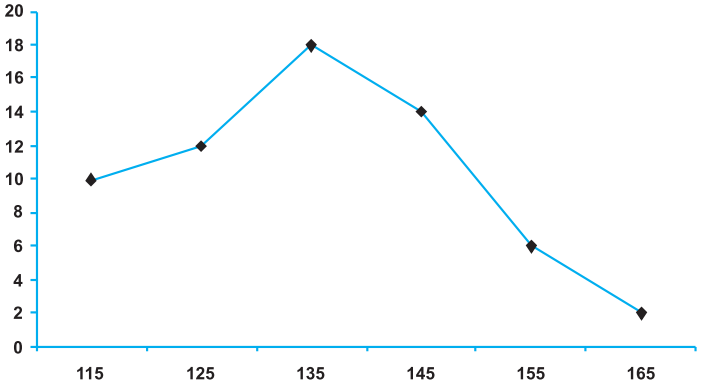
$\frac{PQ}{AQ} = \tan 30^\circ = \frac{1}{\sqrt{3}} \Rightarrow AQ = 80\sqrt{3}$m ...1



$\therefore$ AB $= 80\left(1+\sqrt{3}\right)$m $= 218.4$m ...1

33. Finding class marks as 115, 125, 135, 145, 155, 165

Plotting the points (115, 10), (125, 12), (135, 20), (145, 15), (155, 8), (165, 5)



34. Let the cost of chair be x and that of table be y (in rupees)

$$\therefore \frac{5x}{4}+\frac{11}{10}y=100$$

$$\frac{11x}{10}+\frac{5x}{4}=2130 \qquad \text{...3}$$

solving to get x = Rs. 800, y = Rs 1000 ...3

35. Correctly stated Given to Prove, Construction and Figure ...2

Correct Proof ...4

36.

Class marks (x_i)	102	106	110	114	118	
f_i	15	18	34	16	17 = Σf_i:100	
$d_i = x_i - 110$	–8	–4	0	4	8	...4
$f_i d_i$	–120	–72	0	64	136 $\Sigma f_i d_i$= 8	

$$\text{Mean} = a+\frac{\sum f_i d_i}{\sum f_i}=110+\frac{8}{100}=110.08 \qquad \text{...2}$$